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Scientific Intelligence Report

NEW SOVIET SOLAR RESEARCH CENTER
AND ITS RELATIONSHIP TO THE MANNED SPACE PROGRAM

OSI-SR [REDACTED]

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Brief

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PREFACE

Large solar observatories have potential value to manned space flight because of their use in predicting solar flare activity. Cosmic rays generated in solar flares are currently the greatest natural hazard to manned space flight.

For several years the Soviet press has been describing a new solar observatory under construction somewhere in the Sayan mountains southwest of Irkutsk.

Overhead photography provides the opportunity to locate and follow the development of the observatory's physical plant and thus to establish its size and its rate of expansion. This may indicate the purpose for which the observatory was established.

This study was based on all available information [redacted]

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NEW SOVIET SOLAR RESEARCH CENTER
AND ITS RELATIONSHIP TO THE MANNED SPACE PROGRAM

SUMMARY AND CONCLUSIONS

A new solar observatory installation occupies two sites on either side of the road from Irkutsk to Turta, Mongolia, very close to the Mongolian border. This location is unusually cloud free which was probably an important factor in selecting the site as a solar observatory (center for flare prediction research).

involvement of the observatory's director, V. Ye. Stepanov, in the early phases of solar flare prediction research and the great speed with which the observatory has been built after trial predictions of solar flares had been successfully completed.

The primary purpose of the new observatory is solar activity research and flare prediction, probably in support of the Soviet manned space program. This conclusion is based on the

The observatory is to receive a two meter solar telescope which should be a high quality instrument. With such an instrument, it will be one of the best equipped centers for solar research in the world. Stepanov is believed to be competent to exploit the capabilities of the telescope.

DISCUSSION

Construction of Solar Patrol Station

A TASS release in 1960 mentioned that a station for studying the sun and cosmic rays was being set up on a summit of the Sayan range in Siberia at an altitude of 2,000 meters (6,560 feet) In September 1961, another report announced the establishment of the first high altitude station of the sun service subordinate to the mountain solar expedition of the Siberian Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation (SibIZMIR). It added that the atmosphere is transparent and rarified

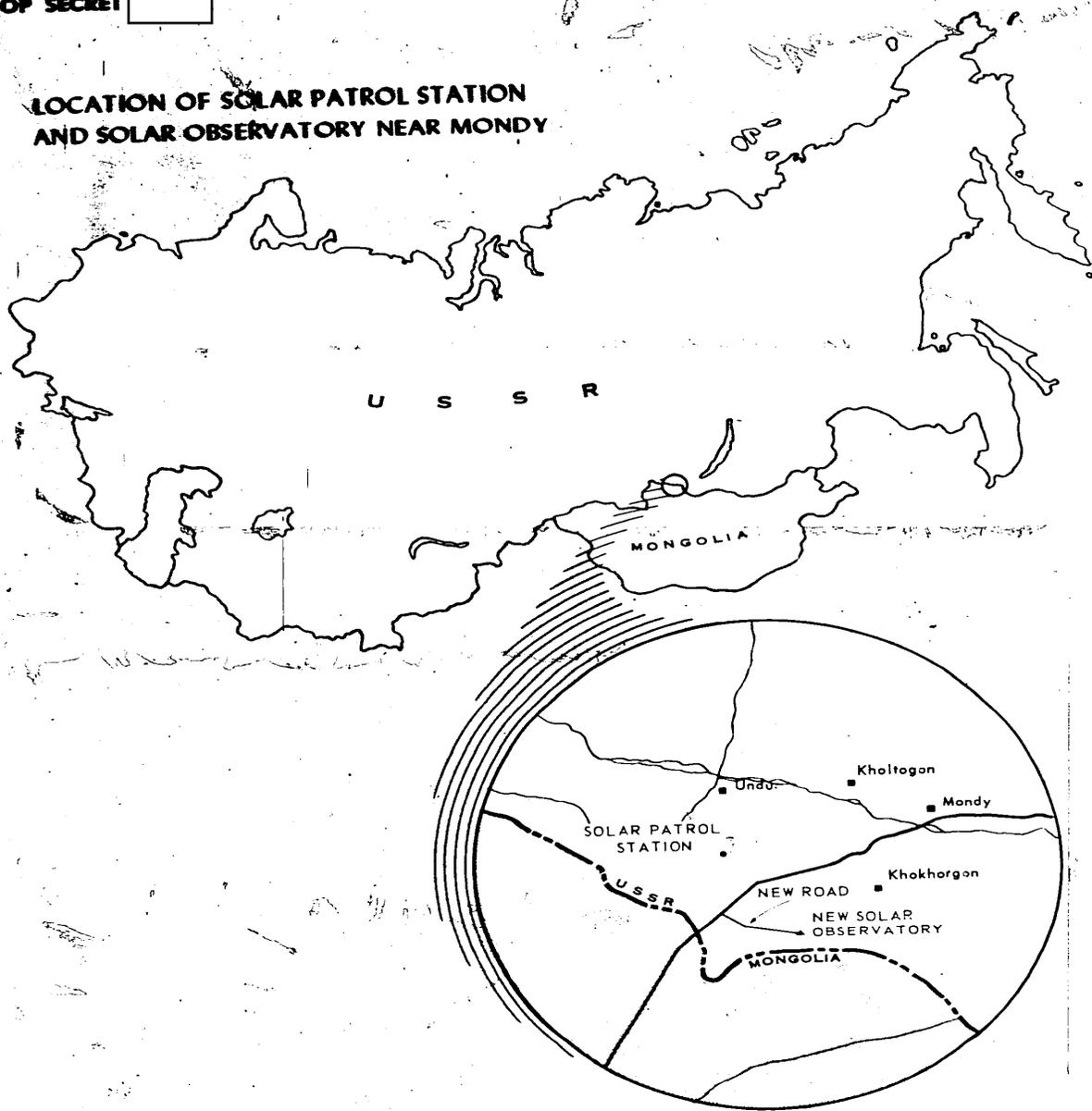
at the site and the sun is covered by clouds only seventeen days per year on the average. In August 1962 a TASS release stated that a Siberian research station for the solar corona was under construction in the mountains southwest of Irkutsk.

Overhead photography [redacted] showed a group of buildings on a hill north of the road from the town of Mondy to the Mongolian border that was not there in 1960. (See Map and Figure 1.) The installation was probably planned in 1960

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LOCATION OF SOLAR PATROL STATION AND SOLAR OBSERVATORY NEAR MONDY



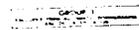
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Figure 1: SOLAR PATROL STATION NEAR MONDY (1962)

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as a solar patrol station* and, if the 1961 press statement was accurate, it was built in 1961. In 1962 it still had the status of a solar patrol station although apparently the Siberian Institute of Terrestrial Magnetism planned to add a coronagraph to the routine solar patrol instruments at the station.

Need for Solar Activity Research Center

From 1957 to 1961, V. Ye. Stepanov and other scientific workers at the Crimean Astrophysical Observatory were studying magnetic fields and other properties of solar active regions. They observed that certain magnetic field configurations tended to precede large solar flares. With the beginning of the Soviet manned space program in 1961, solar flares became a matter of concern to space program planners because of the cosmic ray radiation hazard accompanying them. It was probably in response to this concern that the Crimean Astrophysical Observatory made trial predictions of solar flares based on magnetic field observations from 1961 to 1962. They reported considerable success in predicting a great majority of the large flares. (See OSI-SB/64-7, 14 May 1964, [REDACTED])

The main difficulty with this method of flare prediction is that it depends on frequent observations of the sun with sophisticated equipment. The magnetic

* A solar patrol station is equipped with relatively small optical and radio telescopes for making frequent routine observations of the sun. It is manned by a small number of astronomer-technicians. An observatory would have a number of larger observing instruments and would be manned by astronomers and astrophysicists in addition to technicians.

field data published by the Crimean Observatory clearly show the effect of seasonal variations in cloudiness and hence in the capability of the observatory to make flare predictions. The Soviets made more magnetic field observations for flares during the months of July, August and September than all other months combined. No observations were available for flares occurring in January and February.

In 1962 the decision probably was made to step up solar activity research and to make flare predictions on a more regular basis. An observing site with a minimum of cloudiness clearly was needed. [REDACTED]

[REDACTED] Stepanov had gone to Siberia to set up his own observatory. He probably was examining the patrol station site, since the final decision to proceed with construction undoubtedly was based on his approval.

Construction of the Solar Observatory

[REDACTED] construction of the observatory was well under way. A trail has been put through to a second site south of the road (see map) and a few buildings had been put up. Construction continued all winter and [REDACTED] was essentially completed with most or all of the observing equipment installed.

The completed observatory was described by a March 1964 TASS news release which said that a few months earlier workers of the Siberian Institute of Terrestrial Magnetism, Ionosphere and Radio Propagation had built laboratories and houses and had installed equipment. Scientists already were studying solar physics, cosmic rays, and earth currents. Dr Vladimir Stepanov was identi-

fied as scientific leader of the expedition. Photographs accompanying the release pictured an antenna for monitoring solar radio emission, a chromosphere-photosphere patrol telescope, a coelostat for a horizontal solar telescope and a solar spectrograph or magnetograph.

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Planned Two-Meter Solar Telescope

Stepanov is getting a two meter solar telescope for his observatory.

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A two meter solar telescope is a very large instrument and would be difficult to build at a site served only by a trail.

With a two meter solar telescope, the observatory should be a leader among centers for solar research. The planned instrument is probably comparable to the solar telescope at Kitt Peak, Arizona, which is presently the largest and most powerful of its type in the world. Stepanov is believed to be capable of making good use of such a telescope.

The quality of the solar telescope can be expected to be from good to excellent depending on where it is constructed. The Soviet designed and built solar tower

telescope at the Crimean Astrophysical Observatory is a first rate instrument copied from a successful U.S. design. Consequently, the Soviets probably could copy the Kitt Peak telescope and produce an installation of comparable quality. The Zeiss Optical Works in East Germany has built telescopes of outstanding quality and original design, and if the Soviets ordered a two meter solar telescope from East Germany, they probably would receive a very high quality instrument.

If the Soviet method of making flare predictions is valid, the new telescope is likely to improve the quality of the predictions. It should allow solar magnetic field observations to be made more rapidly and with improved resolution. The improved data may give Soviet investigators new insights into solar flare processes which in turn would allow them to improve the accuracy of their predictions. With this facility, the Soviets probably will be able to improve upon the quality of their short-term (2-3 day) predictions. On the other hand, if the connection between solar magnetic fields and solar flares is already oversimplified, improved data will be more confusing than it is enlightening. Even if it does not improve flare predictions, a two meter solar telescope will be a useful tool for basic solar research.

Probable Connection with the Manned Space Program

The speed with which the new observatory is being built suggests that it is a priority project. Stepanov left for Siberia to examine the proposed site almost immediately after completing the trial flare predictions in 1962. The plans for the observatory must have been completed in about nine months and executed in another

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seven months, with most of the construction being done during the winter of 1963-64.

The timing of the project also suggests a connection with the space program. It was started soon after Stepanov and others demonstrated that a sophisticated study of solar activity could lead to the discovery of a method of predicting solar flares on a short term basis. The 1964 Soviet national report to COSPAR mentioned that short term solar flare predictions were made just prior to the Vostok 5 - Vostok 6 mission in 1963. Soviet bioastronautics authorities continue to express concern over the radiation problem during manned space flights. Thus it seems likely that the Soviet manned space program in some way initiated or stimulated the project and intends to benefit from research performed at the observatory. To date the observatory has not been included in the list of observatories supporting the Soviet IQSY Pro-

gram. All other known Soviet observatories' solar research programs are on the list. This tends to confirm the special nature of the new observatory.

The fact that the new solar observatory has been rushed to completion at a time when expenditures on astronomical facilities are being criticized lends support to the view that this observatory represents a high-priority project, possibly related to the Soviet manned space program. It is conceivable that the costs may have been borne by the space program, although we have no evidence of this beyond the space program interest in flare predictions. The cost to the space program probably would not be large, comparatively speaking. For example, several U.S. astronomers have pointed out that an astronomical facility as large as the 200-inch Mt. Palomar telescope could be built and staffed for the cost of a single Ranger probe launching.

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